DISCUSSION PAPER

89.B.3

IMMIGRATION AND EMPLOYMENT EFFECTS

by

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November 1989

Studies in Social Policy
275 Slater St., 5th Floor
Ottawa, Ontario K1P 5H9

90-04755/

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Preface

Collaborative Research Program
Discussion Paper Series

This study was undertaken as a component of the Collaborative Research Program organized by Statistics Canada and the Institute for Research on Public Policy. Under the terms of this Program, which was launched in 1988, Statistics Canada contributes special Census data, as well as other data required for approved projects. Several professional staff members of Statistics Canada are also providing their time as researchers within the Program. The Institute for Research on Public Policy is responsible for the management of the Program, is contributing the time of in-house researchers to conduct a number of the projects, and is providing stipends and research support to external researchers. The Institute is also responsible for disseminating the results of the research projects.

Considerable financial resources from the private and public sectors have been mobilized in support of the Collaborative Research Program. Status of Women Canada has provided support since 1988 for the overall Program. The Donner Canadian Foundation is supporting a number of projects in the area of immigration, as part of its broader support to IRPP's Social Policy Program for immigration research. Health and Welfare Canada and the Canada Mortgage and Housing Corporation are providing financial assistance for projects in the area of aging. And, the Canadian Labour Market and Productivity Centre is contributing to a project on labour adjustment.

The Statistics Canada/IRPP Collaborative Research Program illustrates the benefits of a program of co-operative research designed to assure the utilization of available data for policy analysis. The individual products of the Program, however, express the views of the authors, and do not necessarily reflect the views of Statistics Canada, IRPP, or the contributing departments and agencies.

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Table of Contents

Page

Acknowledgements vii

Executive Summary ix

Objectives of this Study 1

Policy Issues 1

Contemporary Issues 4

The Model 4

The Displacement Phenomenon 5

The Production Function 7

The Data 8

Initial Results: Canada-Wide, 1981 9

Industries with Concentrations of Foreign-Born Labour 12

Large vs. Small Firms: Homothetic Functions? 15

Elasticities with Tariff-Based Industries 16

Industries with Concentrations of Female Employees 17

The Effect of Recent Flows 18

Conclusions and Policy Implications 24

Notes 27

References 30

Acknowledgements

The author notes with appreciation the support of the Institute for Research on Public Policy, Statistics Canada, and other contributors to the Statistics Canada/IRPP Collaborative Research Program. The comments of the participants of a Department of Economics, Simon Fraser University workshop and of the discussants at the Canadian Economics Association meetings in Windsor in 1988 on an earlier version of this work are also noted with appreciation.

Executive Summary

From the historian's initial analysis of the economic effects of early twentieth-century immigration to Canada to the most contemporary debate over the impact of immigrants, one issue has remained prominent. Do immigrants create jobs or displace native-born workers? This study, unlike the growing number of econometric works on this topic, has as its primary focus an analysis of the effects of Canadian immigration policies on the size and direction of the (un)employment effects in the Canadian economy.

The paper is divided into four parts. First, the author provides a detailed discussion of the evolution of immigration policy between 1945 and 1986, especially with respect to its economic criteria. Next, a review of the relevant economic literature on immigration and job displacement is offered. Armed with the pertinent policy and theoretical literature, the author formulates and econometrically tests the various permutations of the immigrant-job displacement hypothesis. We estimate a translog production function at the three-digit SIC industry level for the economy as a whole and for relevant sub-sectors which reflect the degree of tariff protection, female labour force composition and capital intensity of various sub-sectors of the Canadian economy. By recovering the share equations for these industries we are able to estimate a Hicksian measure of input complementarity.

The author's findings indicate no *economy-wide* labour substitution in the Canadian economy in 1981 or 1986. However, a careful review of important sub-sectors of the economy revealed significant labour substitution. In particular, in two sub-sectors—those with concentrations of foreign-born labour and of female workers—significant labour substitution occur between immigrants and native-born workers.

An important corollary finding is that economy-wide, native-born labour and capital are significant complementary inputs. That is, as companies expand their output and increase inputs to produce this output, they add much more capital when they hire Canadian-born workers than when they hire immigrants. The pattern of these findings holds over the two periods examined (1981 and 1986) as well as across two other disaggregations: capital-intensive industries where the average firm size is large and tariff-protected industries.

These results are generally in agreement with other Canadian studies on this topic, but they are in sharp contrast to findings in the United States, where substantial economy-wide immigrant and native-born labour substitution occurred.

Finally, in light of these findings the author evaluates the success or failure of post-1945 Canadian immigration policy with respect to the job displacement debate. The author concludes that the absence of economy-wide labour force substitution between native-born and foreign-born labour force is an outcome of a post-1967 immigration policy that focused on mitigating substitution effects. However, the observed substitution, especially in industries where female workers are concentrated, may also be a product of immigration policy, namely

the substantial rise in the number of immigrants in the family re-unification class. This latter point should be the subject of future detailed research.

Immigration and Employment Effects

Objectives of this Study

From the historian's initial analysis (Dales 1964, 1966) of the economic effects of early twentieth-century immigration to Canada to the most contemporary debate over the impact of immigrants, one issue has been the primary focus. Do immigrants create jobs or displace native-born workers?

This study, unlike the growing number of econometric works on this topic, has as its primary focus an analysis of the effects of Canadian immigration policies on the size and direction of changes in (un)employment in the Canadian economy. The paper is divided into four parts. We begin with a detailed discussion of how immigration policy evolved between 1945 and 1986, especially with respect to economic criteria. Next, a review of the relevant economic literature on immigration and job displacement is offered. Armed with the pertinent policy and theoretical literature, we go on to formulate and test econometrically the various permutations of the immigrant-job displacement hypothesis. Finally, in light of our findings we evaluate the success or failure of post-1945 Canadian immigration policy with respect to the job displacement debate.

Policy Issues

The study of the employment effects of immigration flows on the Canadian labour force has been a rich source of policy debate since at least the turn of the century in Canada. Increased immigration, along with higher tariffs and railroad investment, helped form the cornerstone of the *fin de siècle* National Policy. The expressed goal of increasing immigration was to populate the prairies. The growing urbanization of immigrants and their changing skill mix (from farmers to urban artisans or semi-skilled labour) led to fears of job displacement. The problem was argued to be twofold. First, immigrants destined for prairie farming were deflected to urban occupations, and the consequent decline in urban wages pushed native-born Canadians to the United States. Thus, this displacement or emigration of native-born Canadians led to inefficient immigrant flows. These flows were deemed inefficient in the sense that it took greater and greater gross flows of immigrants to achieve a given amount of net population growth. Contemporary economic historians have focused even more closely on the economic implications of this displacement effect. J. Dales (1964, 1966) has asserted that immigration with its consequent displacement led to extensive growth as opposed to intensive growth.[1] In strict economic terms Dales is asserting that increased population size raised turn-of-the-century GDP but suppressed income per head for the remaining residents.[2] Thus, increased immigration could be viewed as a positive contribution to the Canadian economy only if extensive growth was the government's objective.

Others have dissented from this basically negative interpretation of the historical impact of increased immigration flows, but still emphasize the negative impact of immigrants on the wages of native-born labour. Chambers and Gordon (1966) have argued that increased immigration allowed the Canadian manufacturing sector to grow after 1900 because the increased labour supply and constant real wage increased the financial surplus (i.e., profits) available for investment. Chambers and Gordon emphasize the income redistribution (labour to capital) impacts of immigration, which they judge to be beneficial. The legacy of this historical research has been to focus the modern policy debate as well as to lend continuity to the debate. We turn now to the task of outlining more contemporary issues arising from post-1945 immigration and their subsequent impact on the labour market.

A. Green (1976) provides a comprehensive summary of the postwar immigration policy debate up to 1970. Green interprets post-1945 immigration issues in terms of successive changes to the longstanding Immigration Act of 1911. From 1911 until the 1953 Immigration Act, the cornerstone of Canadian immigration policy was unlimited admission from source areas characterized as "most preferred" countries. The country preference designation (mainly western European) reflected the similarity of these immigrants in terms of their customs and/or language to the existing Canadian population. Given these criteria, decreasing preference was given to immigrants from central, eastern and southern European sources. All others, except U.S. citizens, were placed in the "non-preferred" category. Clearly, the issue of employment displacement by immigrants was not manifested in the 1911 Act.

With the introduction of the 1953 Immigration Act (RSC 1952, c 325) some of the impact of country preference was mitigated. Green argues that economic forces, in the form of chronic excess demand for labour, caused this change. Green also states that immigration levels were largely dictated or rationalized by the concept of "absorptive capacity". This term now presumably recognized both economic and social absorptive capacity. However, further political and economic forces were working in the 1950s to remove the country preference clause from the 1953 Act. A fundamental change occurred in the Immigration Act of 1962. A policy with no explicit country preference was introduced; instead the emphasis was placed on reuniting families and admitting highly skilled labour. Green interprets this policy change as an outgrowth of the declining supply of European immigrants and the need for human capital.

Thus, in Green's interpretation of the 1945 to 1962 period, a shift in the focus of immigration issues, from social to economic concerns, clearly occurs. As Green states:

> In one statement, then, the old policy based on [a] national origins concept had been swept away, and in its place a policy based on the individual skills of the prospective immigrant regardless of his country of origin was adopted (1976, p. 36).

In other words, by emphasizing economic criteria the new policy placed economic issues in the forefront of immigration policy.

By 1967 an objective point system governing admissions was formalized, which would now allow debate over specific economic criteria. For the independent immigrant group, successful applicants required a minimum number of points out of a possible total of 100. Points were based upon education, skills, age, personal qualities, employment arrangements, area of destination, occupational demand, and knowledge of French and English. For other

important admission categories, sponsored or nominated immigrants, the economic criteria were not as stringent. This new policy reflected the general view that immigrants made a net contribution to Canadian society. This view seemed appropriate during the boom period of the 1960s when concern about employment effects was at a minimum; rather, the easing of labour shortages through immigration was the primary concern. Thus, the policy regime that prevailed between 1962 and 1976 could be termed expansionist, accepting immigrants from all source areas with a generally growing yearly quota level. By the mid-1970s this expansionist policy view had changed dramatically.

The Immigration Act of 1976 required that formal yearly targets be set based upon economic and demographic conditions in Canada and a report tabled in Parliament. The philosophy of the period, as reflected in the 1975 government position paper, was based on the explicit argument that immigrants, at best, provided a small net gain to the economy. W. Marr and M. Percy (1985) argue that this view set in motion a Canada First policy, which was tied closely to unemployment and job vacancy rates. Thus, the heretofore simple accumulation of a given number of points did not automatically qualify a potential immigrant to line up in the independent category queue.

Several policy initiatives were introduced to limit the size and job displacement effect(s) of fluctuations in the size of the independent category. In 1981, in addition to global targets, specific targets were set for the economic category alone. During the most restrictive period, 1982, immigrants required a validated job offer for entrance in the independent category. Furthermore, an elaborate point system based on a multi-digit SIC occupational matrix was put in place. In fact, independent immigrants whose occupational classification yielded zero points were automatically excluded. In sum, the period 1976 to 1984 reflected an almost myopic concern with the issue of labour substitution. Stringent economic criteria based on scant professional evidence of the economic impact of immigrants led to a declining global target in 1984-85.

During the most recent period, 1985 to 1988, another shift in policy occurred, leading to higher global targets; as well, new business and economic classes have been added to the three traditional admission categories. Again, the philosophy is changing; in particular the 1985 Employment and Immigration Annual Report to Parliament states explicitly the government's view on labour substitution:

> The federal government does not accept the popular misconception that immigrants take jobs away from Canadians. Immigrants contribute to economic growth and job creation by augmenting capital formation... (1985, p. 1).

Thus, in a ten-year period (1976 to 1986) various governments have based their policies on two conflicting hypotheses with respect to labour substitution: immigrants create jobs or immigrants take jobs from Canadian-born workers. The task of this paper is to test these hypotheses formally. However, it should also be noted that the substitution effect of the foreign-born in today's labour market is a product of the last 40 years of policy. Our policy review suggests that job displacement was not an important policy consideration until 1967 and not a paramount concern until after 1976. Because of these fluctuating policy positions on labour substitution, there is no *a priori* reason to believe that job displacement would or would not result from the post-1945 flow of immigrants in 1980 or 1986.

Contemporary Issues

The main labour substitution issues that arise in the modern Canadian immigration experience are more complex than alluded to in the preceding policy summary. The changing immigrant occupational mix, from semi-skilled in the 1950s to highly human capital intensive in the 1970s (DeVoretz and Maki 1980), leads to several types of potential labour substitution or capital complementarity. For example, will this heterogeneous immigrant flow differ in its degree of substitution by date of arrival? Moreover, will the post-1970 flow, with its higher than average human capital content, substitute for both earlier, less skilled immigrants as well as native-born labour? In addition, will the earlier or later arriving immigrant groups require or substitute for physical capital? Finally, is immigrant labour substitution industry-specific? In other words, are tests of the displacement hypothesis sensitive to particular industry groupings? If so, what are these industries and their characteristics?

Some industry characteristics that could obviously effect the degree of substitution are the degree of unionization (see Maki and Meredith 1987) or tariff levels (Dales 1964). In addition, a commonly held view is that certain industries provide entry level jobs for particular types of immigrants (Seward 1989). For example, if recent immigrants are concentrated in slow growing textile and other tariff-protected, labour-intensive industries, it is possible that a segmented economy exists, consisting of a foreign labour sector that exhibits substitution and the rest of the economy, which experiences no substitution. Scale effects have also been alluded to in the literature as a factor accentuating the degree of labour substitution between skilled and unskilled labour and capital. Thus, large, capital-intensive industries prove less prone to labour substitution, whether it be native-born or foreign-born.

These are the main unanswered questions surrounding the nature of possible immigrant labour substitution. It is also important to note that the corresponding policy implications depend on the outcome of the associated tests of these hypotheses. For example, if labour substitution is specific to sex or to industry size or type, then specific immigration policy changes are implied. Without anticipating the results, one possible outcome is that only female immigrants in labour-intensive and tariff-protected industries exhibit substitution relative to native-born labour. In this case, immigration policy may be successful in general in preventing substitution, but the economy's weakest sector could be forced to absorb all of the minor substitution effects. These interpretations are premature, however. We must first model the substitution effect formally and test the hypotheses before addressing the policy implications. We turn now to the task of model construction.

The Model

To analyze the displacement issue, elasticities of substitution between immigrant labour and native-born labour must be computed. For this purpose a production function has been specified for all relevant Canadian industries; the function will be applied at several levels of aggregation. Before we specify the production function, a theoretical exposition of the displacement phenomenon follows.

The Displacement Phenomenon

Consider an immigrant-receiving country that produces a single, non-exported output by means of two inputs, capital and homogeneous labour. The left panel of Figure 1 presents a situation in which the world supply of labour is perfectly elastic at wage rate (W_e). The right panel shows the labour market in the immigrant receiving country, i.e., Canada. If labour were to seek its maximum earnings with negligible transportation and other costs and with no institutional impediments, then (cd or a'd') workers would migrate to Canada. Thus, the Canadian labour supply would increase from (S_c) to (S_c") and its wage rate would fall to the world equilibrium level or (W_e). On the other hand, if Canada closed its borders, the wage rate in Canada would be (W_c).

In addition, if independent events such as a rise in product price or increased complementary capital appeared in the economy, then these supply shifts induced by immigration could be offset by labour demand shifts. For example, even with open immigration (i.e., supply shifts to S_c") the original equilibrium wage of W_c could be maintained by a shift in the demand curve equal to D_c". This of course would result in no domestic displacement and a constant wage rate.

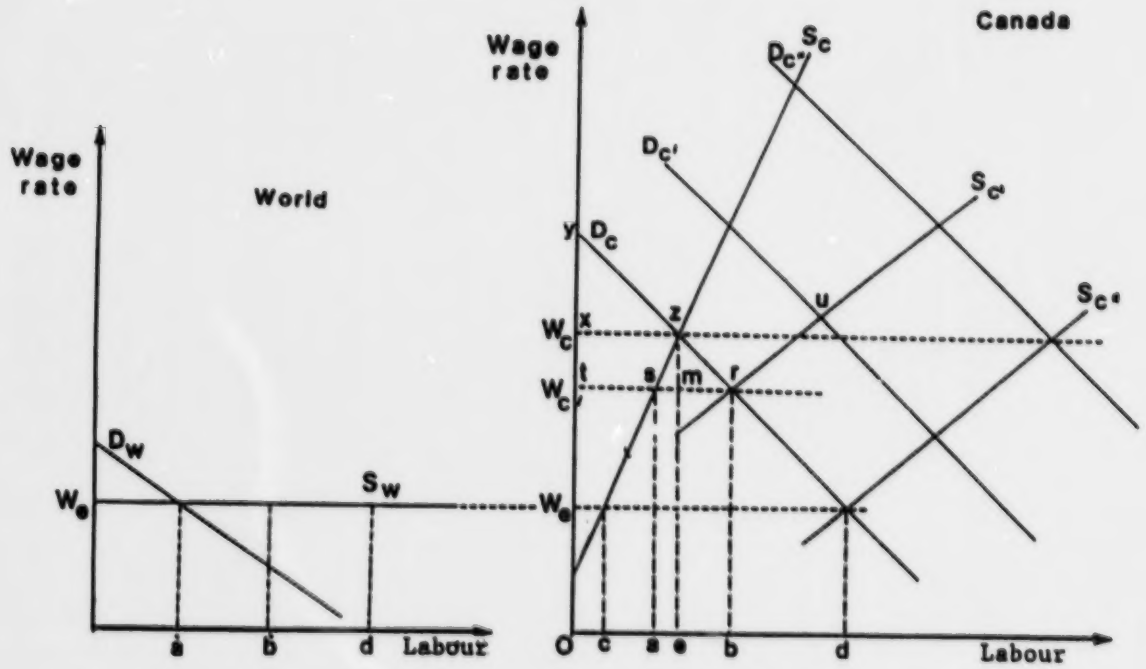
Given immigration to Canada, albeit with a binding quota of (ab=a'b') workers, an increase in the labour supply from (S_c) to (S_c') would result. In particular, this restraint on immigration appears appropriate in the Canadian context under the period of study (DeVoretz and Maki 1983). Now this limited increase in immigration would have two important consequences. First, the domestic wage rate would fall to (W_c'), and total employment would rise from (Oe) to (Ob). However, domestic employment declines from (Oe) to (Oa). Thus, immigrants displace domestic workers by the amount (ae). Second, when the wage rate falls from (W_c) to (W_c'), labour earnings change from (oxze) to (otrb), of which (otsa) accrues to native-born workers and (asrb) to immigrants. The earnings of native-born workers have fallen from (oxze) to (otsa). On the other hand, returns to non-labour factors, e.g., capital, have risen from (xyz) to (tyr). Hence, certain factors in Canada (capital) benefit from immigration, while others (native-born labour) are injured.

Finally, the existing wage differential of (W_c'-W_e), relative to the immigrant's opportunity cost, is no doubt substantial. Given such a substantial wage differential, the continued build-up of demand for entry to Canada from abroad would be expected.[3]

The actual wage and employment changes resulting from any immigration flow depend upon the domestic elasticities of labour demand and supply, the magnitude of the quota, and other assumptions implicitly embedded in Figure 1. In general, the more inelastic the demand and supply relationships, the greater the reduction of domestic wages resulting from any given amount of immigration. Moreover, the more elastic the labour supply and the less elastic the labour demand, the greater the displacement effect. Thus, estimates of elasticities of substitution between native-born and immigrant workers with respect to factor price movements are the appropriate measure of displacement.[4]

Figure 1

Immigration and Labour Displacement



As noted, several studies, especially in the United States, report cross-elasticities between various vintages of immigrant and native-born labour; these are discussed in detail below. Grossman (1982) used 1970 cross-sectional U.S. data to estimate a translog production function to determine the substitutability between capital, employed native-born workers, employed second-generation workers, and employed foreign-born workers.

There are several policy and theoretical reasons to emulate Grossman's methodology in the Canadian context with appropriate adjustments. The use of a translog production function leads to several desirable features, including the explicit inclusion of capital with no *a priori* restrictions on the elasticity measure or the degree of homogeneity or homotheticity of the production function. These theoretical properties have important policy issues as counterparts. First, capital substitutability (or complementarity) with respect to factor income directly addresses the important issue of the immigrant's effect on income per head.[5] Also, varying the degree of homogeneity allows for the possibility of scale economies, which has been a Canadian policy rationale for increased population size through immigration.[6] Finally, homotheticity or a changing capital-labour ratio under different scales of output permits different degrees of immigrant substitution as industry size grows.

The Production Function

The production function is specified as:

Equation 1 $Yi = f(Ki, Ni, BIi, Ii)$

where:

- Yi = Value added in industry i
- Ki = Capital stock in industry i
- Ni = Employed labour in industry i age 15 years and over who were born in Canada
- BIi = Employed labour in industry i age 15 years and over who were born abroad and migrated to Canada prior to 1971
- DIi = Employed labour in industry i age 15 years and over who were born abroad and migrated to Canada after 1971

The above production function has been estimated in translog form. The factor share equations, i.e., the demand equations for each of the included factors, can be derived under the assumption of perfect competition. These are given below:

Equation 2a $SKi = \alpha k + \delta k,kLnKi + \delta k,nLnNi + \delta k,bLnBIi + \delta k,dLnDIi$

Equation 2b $SNi = \alpha n + \delta n,kLnKi + \delta n,nLnNi + \delta n,bLnBIi + \delta n,dLnDIi$

Equation 2c $SBIi = \alpha b + \delta b,kLnKi + \delta b,nLnNi + \delta b,bLnBIi + \delta b,dLnDIi$

Equation 2d $SDIi = \alpha d + \delta d,kLnKi + \delta d,nLnNi + \delta d,bLnBIi + \delta d,dLnDIi$

where SKi is the share of capital in production measured as the product of its price and quantity divided by the output in industry i. Similarly SNi, SBIi and SDIi are the respective shares accruing to Canadian-born (NIi) workers and old (BIi) and recent (DIi) immigrant labour in industry i. Demand theory requires symmetry, so that $\delta a,b = \delta b,a$. We also impose homogeneity: $\Sigma a. = 1$.[7]

When assuming that quantities and not prices are exogenous, the appropriate measure of factor substitutability is Hicks's elasticity of complementarity (see Grossman 1982). The Hicks's elasticity of complementarity (Cab) is defined as the proportional change in the relative wage for factor (a) given a proportional change in factor (b's) endowment, holding output price and other input quantities constant. In terms of the translog coefficients, it can be given by the following formula:

Equation 3 $$Cab = (\delta ab + Sa\ Sb)/Sa\ Sb)$$

where (Sa) and (Sb) are the average shares of factors (a) and (b) respectively. Factors (a) and (b) are substitutes if (Cab) is negative and complements if (Cab) is positive.

A problem arises in calculating the all-important standard errors for the elasticities, because the elasticities are nonlinear functions of the estimated parameters. Since the shares themselves are functions of these parameters, it is difficult to calculate the variances of these elasticities without reverting to Monte Carlo simulation. However, approximate estimates of the standard errors can be obtained by employing the preceding elasticity formula (Equation 3). The derived formula for the standard errors of the elasticities is given as:

$$\{V\,[Cab]\}^{1/2} = \{V\,[\delta ab]/S^2a\ S^2b\}^{1/2}$$

This formula has been shown by Pindyck (1979) to hold asymptotically. Also, recent work by Anderson and Thursby (1986) using Monte Carlo experiments evaluated properties of elasticity estimators. They concluded that if the elasticity estimator uses means of actual (observed) shares, a normal distribution for the elasticity estimator is appropriate.[8]

The Data

The factor share equations are originally estimated for 125 Canadian manufacturing and non-manufacturing industries using 1980 three-digit SIC code. In terms of employment these 125 industrial groupings represent approximately 93 per cent of the Canadian labour force in 1980.

The value added data were drawn primarily from published sources (Statistics Canada, Catalogue 61-213). Some of the unpublished figures were obtained by special request from Statistics Canada.

Capital stock data for Canadian non-manufacturing industries were obtained from Statistics Canada, Catalogue 13-211. For manufacturing capital, data were obtained from unpublished sources (Statistics Canada, Capital Stock Division).

The income data for immigrant and native-born labour were obtained from the 1981 Canadian Census. The labour market Census information is for 1980. Since a detailed breakdown of income and employment for immigrant and native-born labour by industry groups is not available from published sources, these data were obtained by special request from Statistics Canada.

Initial Results: Canada-Wide, 1981

The system of factor equations described earlier was estimated using the iterative Zellner's seemingly unrelated regression technique to take account of the obvious cross-equation correlations.[9] Capital's share is taken to be 1 minus the share of labour.

The estimated economy-wide production function coefficients are presented in Table 1. First, we note that the coefficients on the capital interaction terms are all individually close to zero. Thus, since capital is separable from all types of labour, capital does not have to be included in either the demand or the share equations. However, following Grossman (1982) when calculating the elasticities, we will not omit capital from our model.

Table 1
Translog Coefficients for the Production Function

Coefficient	Value	Standard Error
Cn	0.32	0.81
Cd	0.12	0.01
Cb	0.22	0.02
Cn,n	0.09	0.01
Cn,d	-0.02	0.002
Cn,b	-0.07	0.003
Cn,k	-0.004	0.01
Cd,d	0.02	0.001
Cd,b	0.002	0.002
Cd,k	-0.0005	0.001
Cb,b	0.07	0.003
Cb,k	-0.001	0.002

The economy-wide average share for each factor input is shown in Table 2. It can be seen that, as would be expected, the native-born workers' share of value added in total output is greater than that of foreign-born workers. The residual share accruing to physical capital is 42 per cent.[10] Given these factor shares we are able to calculate the all-important elasticities.[11]

Table 2
Means of the Variables for 125 SIC Industries, 1981

Variable	Mean
Share of native-born workers' value added in output	0.43
Share of earlier immigrants' value added in output	0.11
Share of recent immigrants' value added in output	0.04
Share of capital's value added in output	0.42
Number of native-born workers (thousands)	7,553
Number of earlier immigrant workers (thousands)	1,314
Number of recent immigrant workers (thousands)	489
Amount of capital used (thousands of dollars)	557,898

Table 3 reports the estimated elasticities using the information drawn from Tables 1 and 2. For convenience, pre-1971 immigrants are termed earlier immigrants and those arriving later recent immigrants. This distinction between immigrant vintage is an attempt to recognize the hypothesis that the two immigrant pools are drawn from different populations. Post-1971 immigrants are obviously younger, have a higher amount of human capital, and differ in ethnicity when compared to the earlier immigrant flow.[12] Clearly, if the estimated cross-elasticities between the two vintages of immigrants differ significantly, then they are in fact drawn from a different population. The corresponding policy issue, which is being tested indirectly, is the effect of the 1967 Immigration Act. It should be remembered that only after 1967 did Canada employ a point system that did not discriminate by country of origin.

Table 3 also reports the standard errors of the elasticities using the formula described in the text and the corresponding t-ratios.[13] The t-ratios are calculated under the hypothesis that the corresponding elasticity is zero, i.e., there is no cross-effect. The critical t-value at the 0.05 level of significance is 1.96.

Table 3
Elasticities of Factor Complementarity for 125 Industries, 1981

Elasticity between:	Value	Standard Error	T-Value
Native-born and earlier immigrants (Cn,b)	-0.41	1.10	-0.37
Native-born and recent immigrants (Cn,d)	-0.41	2.46	-0.17
Native-born and capital (Cn,k)	0.98	0.43	2.28*
Recent immigrants and capital (Cd,k)	0.99	0.88	1.12
Earlier and recent immigrants (Cb,d)	1.45	9.39	0.15

* Indicates significance at the 0.05 level of significance.

It is observed from Table 3 that the elasticity of substitution between native-born workers and earlier immigrants, as well as between native-born workers and recent immigrants, is negative. This negative elasticity value implies that immigrant labour substitutes for native-born labour. However, the corresponding t-ratios indicate that the elasticity coefficients are not statistically significant at the 0.05 level. Hence, the hypothesis that there is no displacement of native-born workers by immigrants can be accepted for both earlier and more recent immigrant flows. Furthermore, it is also important to note that both earlier and recent immigrants affect the employment of native-born workers to the same extent (the elasticity values are identical). Hence, we must reject the hypotheses that the pre- and post-1971 immigrant pools have differential substitution effects with respect to the native-born labour force. To the extent that the elasticity value for the earlier immigrants can be regarded as the long-run elasticity, it can also be argued that there is no statistical difference in the long- and short-run effects.

The economy-wide elasticity of substitution between earlier and recent immigrants is found to be positive. This value is also greater than unity, implying that an increase in the employment of earlier immigrants is proportionately greater than any given increase in the recent immigrant supply. Recent immigrants in Canada seem to be complements to the earlier immigrants. However, the corresponding t-ratio for this elasticity is also insignificant, implying that the hypothesis that recent immigrants do not affect the employment of earlier immigrants cannot be rejected.

The economy-wide elasticities of substitution between capital and all types of labour (Cn,k, Cd,k, Cb,k) are all found to be positive, indicating that capital is a complementary input for labour in 125 Canadian industries. However, the t-ratios indicate that only the elasticity of substitution between native-born labour and the capital stock is statistically significant.

To this point we conclude that, on the basis of 1981 data, there is no evidence to support the economy-wide displacement hypothesis or that immigrants are capital using. Previous work by Clark and Thompson (1986) and Roy (1987) on substitutability in Canada present, respectively, conflicting and some confirming results for our findings. Clark and Thompson (1986, p. 26), using a different methodology and data set (circa 1970), find all Canadian labour (i.e., immigrant and native-born combined), except professionals, to be substitutes for one another.[13] In addition, they find all Canadian labour to be complementary to capital. From these findings Clark and Thompson conclude that increased immigration would lead to job displacement and intensive use of existing capital. However, it must be kept in mind that Clark and Thompson do not ever disaggregate immigrant and native-born labour; at best, then, their results are not comparable to this study.

Roy (1987) partially confirms our initial findings, concluding that his estimated interaction term in the appropriate wage equation indicates that all foreign-born workers are neither substitutes nor complements.[15] We have shown of course that when capital is included and elasticities are actually computed, these results are maintained, as well as demonstrating capital complementarity with respect to native-born workers.[16]

Our findings are in sharp contrast, however, with Grossman's U.S. findings using 1970 data. Grossman (1982) concludes that both second-generation and foreign-born workers are significant substitutes for U.S. native-born workers. Second-generation workers, however, are found to be more highly substitutable for U.S. native-born workers (i.e., -.92) than are foreign-born workers (-.32). Grossman also found that capital is a significant complement to each type of worker, but the elasticity of complementarity is highest for foreign-born (.85) and weakest with respect to native-born workers (.69). Our economy-wide findings may conceal substitution by sub-sectors. Thus, we turn now to the task of disaggregating our tests in light of the policy issues outlined earlier to assess the robustness of our economy-wide findings.

Industries with Concentrations of Foreign-Born Labour

Since the economy-wide elasticity results in Table 3 report insignificant substitution effects between native-born and any vintage of foreign-born labour, the next obvious question is, how robust are these findings? The most obvious tactic to detect any significant substitution effect is to select those industries with a high concentration of foreign-born workers. We defined a high concentration of foreign-born workers arbitrarily as any three-digit SIC industry group with more than 23 per cent of its labour force foreign-born.[17] A sampling of this sub-set of industries appears in Table 4. Several features of these selected industries are important. First, although many of the selected 59 industries are characterized by an unskilled labour force using labour-intensive techniques (e.g., bakeries, clothing, food processing), many groupings are highly skilled (e.g., universities, machine shops, metal stamping). Thus, no generalization appears *a priori* for this sub-set of industries other than the pre-selected degree of concentration of foreign-born workers.

Table 4
Ratio of Foreign-Born Workers to Total for Selected Industries

Description	SIC #	Absolute # (000s) Foreign-Born	Foreign-Born as % of Total
Meat and Poultry	101	12.7	28
Bakery	107	12.3	30
Food (Misc.)	108	10.6	27
Plastics Fabricating	165	11.2	32
Men's Clothing	243	19.0	45
Women's Clothing	244	21.0	51
Household Furniture	261	13.6	34
Universities & Colleges	806	39.0	31
Hardware, tool & cutlery	306	9.2	38
Metal Stamping	304	10.0	29
Machines Shops	308	7.5	32
			--
			AVERAGE 18%

Table 5 reports the calculated elasticities of complementarity and associated test statistics for industries with above-average concentrations of foreign-born workers. One result is obvious. Now both recent and earlier immigrants are significant substitutes for the native-born labour force. Moreover, in contrast to our earlier results, no significant capital complementarity is found between the native labour force and capital. Also, capital is not a significant complementary input to either recent or earlier immigrants. Finally, immigrants of different eras are not substitutes for one another. In sum, these findings contrast sharply with the Canadian economy-wide results reported in Table 3.

Given these significant results, the actual degree of displacement between native-born and foreign workers can now be calculated for this sub-set of 59 industries. For example, given the calculated average substitution elasticity (i.e., -.67), we can measure the impact of a 1 per cent rise in foreign-born labour on native-born employment. For example, in the meat and poultry, clothing (combined) and university groups, the absolute marginal displacement of native-born workers for each 1 per cent rise in their immigrant labour force is 214, 582 and 268 respectively.[18] Clearly, the degree of displacement depends directly upon the labour-intensive nature of the industry and the absolute number of native-born workers in the industry. In general, across the pre-selected 59 industries a 1 per cent rise in foreign-born labour will reduce native-born employment by 2,543 workers.[19] These disaggregated findings are now consistent with Grossman's U.S. economy-wide findings that, regardless of vintage, immigrants substitute for native-born labour. However, in contrast to Grossman we find this

significant displacement for only a select group of industries. Also, unlike Grossman's industries our selected Canadian industries had two unique features: capital's share of value added was inordinately high (Table 6), and these industries had a concentration of foreign-born workers greater than the average concentration in the Canadian labour force.[20]

Table 5
Elasticities of Factor Complementarity Industries with Above-Average Concentrations of Foreign-Born Workers, 1981

Elasticity between:	Value	Standard Error	T-Value
Native-born and earlier immigrants	-.67	.33	-9.3*
Native-born and recent immigrants	-.67	.25	-2.7*
Native-born and capital	1.08	1.35	.8
Recent immigrants and capital	.99	.57	1.71
Earlier immigrants and capital	1.02	.65	1.57
Earlier and recent immigrants	.28	.21	1.33

* Indicates significance at the 0.05 level of significance.

Table 6
Mean Values of Income Shares for Industries with Above-Average Concentrations of Foreign-Born Labour, 1981

	Income Share
Recent immigrants	.12
Older immigrants	.14
Native-born workers	.11
Capital	.63

Large vs. Small Firms: Homothetic Functions?

There exist both theoretical and policy issues that suggest that disaggregation by industry size is appropriate. Theory suggests that production functions and complementarity measures may be sensitive to absolute size. Industries with large firms, for a variety of reasons, in particular technology, may use different techniques from industries with smaller firms and hence may experience different degrees of substitutability for inputs. The policy counterpart to this theoretical construct is that industries with smaller firms provide entry level jobs for both native-born workers and immigrants. The example most often cited is the supposed tendency of small firms to be both labour-intensive and free from institutional barriers, e.g., unions, enabling easy job entry for immigrants. In contrast, industries with large firms require more capital-intensive techniques, which are less flexible in altering labour requirements because of the presence of institutional barriers (see Maki and Meredith 1987).

To test for significant differences in elasticities of complementarity by size we arbitrarily limited our sample to the 34 industrial groups with the greatest average value added per firm at the three-digit SIC level in the economy in 1981.[21] Clearly, there exist other indications of size, and we employed these as a cross-check.

Table 7 reports the elasticity measures for the 34 industries with the highest level of value added per firm. If we contrast these findings with the measures in Table 6 (industries with above-average proportions of foreign-born workers), the crucial elasticities of native-born

Table 7
Elasticities of Factor Complementarity for Industries with Largest Average Firms, 1981

Elasticity between:	Value	Standard Error	T-Value
Native-born and earlier immigrants	.40	.05	8.0*
Native-born and recent immigrants	.32	.038	10.5*
Native-born and capital	14.2	.2	71.0*
Recent immigrants and capital	1.11	.1	11.1*
Earlier immigrants and capital	1.13	.03	36.6*
Recent immigrants and earlier immigrants	.93	.03	31.0*

* Indicates significance at the 0.05 level of significance.

relative to immigrant workers for the large-scale firms are significantly different. First, for these large firms, old or recent immigrants are complements to native-born labour and not substitutes as found earlier. In fact, for these large firms, a 1 per cent rise in native-born labour employment led to a small, but significant (.4 and .3 per cent) rise in the employment of old and recent immigrants respectively. For the industries with concentrations of foreign-born workers, a rise in either immigrant vintage group led to a decline in native-born employment.

The remaining cross-elasticities in both our contrasting cases have the same signs and, with the exception of the degree of complementarity of native-born labour and capital, no other sharp differences occur. For industries with large firms, native-born labour becomes very complementary (14.2) with respect to capital, while degrees of complementarity for immigrants of both vintages remain low (range between 1.1 and .9).

In sum, two points emerge. Industries with large firms hire both foreign-born and native-born labour as they expand output and necessarily employ more inputs. However, with this expansion in output, they add much more capital as they hire native-born labour than when they hire immigrant labour. The implications of this pattern of results for large industries are complex and will be pursued later in the section on policy implications.

Elasticities with Tariff-Based Industries

One important institutional factor alleged to influence the degree of displacement is the tariff level of the industry. In Dales's historical analysis, tariffs were the mechanism that induced labour-intensive (i.e., immigrant-intensive) manufacturing growth. This view is maintained to this day. The hypothesis we propose is that, contrary to historical interpretations and contemporary views, the elasticity of complementarity within tariff-sheltered industries is not significantly different from that in the economy in general. To test this hypothesis we selected those three-digit SIC industrial groupings with a nominal tariff of at least 6 per cent. The complete elasticity measures for this tariff-intensive industrial group appear in Table 8.

An appropriate analysis of this sector must include a comparison of these results with both the Canada-wide findings (Table 3) and the elasticities for industries with concentrations of foreign-born labour (Table 6).

We note first that the high-tariff industries do not exhibit significantly different elasticity values with respect to any pair of inputs relative to the economy-wide results, with the important exception of native-born and early immigrant labour. However, there are substantial differences between labour elasticities in the industries dominated by foreign-born labour and the high-tariff group. Again, native-born versus earlier immigrants show a much higher degree of substitution in the tariff-based industries than in the industries where foriegn-born workers are concentrated. In addition, the cross-elasticity between native-born workers and recent immigrants is significant and negative in the sector dominated by foreign-born labour and insignificant in the tariff sector. One important comparison remains. For our three comparison groups the share accruing to labour varies widely; the tariff sector's capital

share is only 14 per cent, compared to 42 and 63 per cent respectively for the economy-wide results and the sectors where foreign-born workers are concentrated. This latter fact points to the extreme labour-intensive nature of the tariff sector.

Table 8
Elasticities of Factor Complementarity High-Tariff SIC Groups, 1981

Elasticity between:	Value	Standard Error	T-Value
Native-born and earlier immigrants	-1.73	1.04	1.66
Native-born and recent immigrants	.50	9.6	.05
Native-born and capital	.96	.5	1.92
Recent immigrants and capital	.86	.07	12.2*
Earlier immigrants and capital	1.00	.1	10.0*
Recent immigrants and earlier immigrants	1.05	9.25	.11

* Indicates significance at the 0.05 level of significance.

Industries with Concentrations of Female Employees

A recurring theme in any labour market analysis is the differential treatment of factors of production by sex. Immigration labour markets are no exception. In fact, because of several inherent features of the female immigrant labour force (their concentration in low-wage and labour-intensive industries), there exists the hypothesis that female substitutability relative to other inputs differs from that of the male labour force. We test this hypothesis in this section and report the results in Table 9.

To segment the labour force we again employed an arbitrary rule; all three-digit SIC industries with female concentration ratios greater than 40 per cent were selected.[22]

Several new patterns emerge with respect to input substitution. In general, female immigrants and female native-born workers are complementary inputs, regardless of the vintage of immigrants. In contrast, female immigrants and the male native-born labour force were substitutes in the female-dominated industries we selected. However, males and native-born females are not significant substitutes but significant complements (i.e., their elasticity

equals .98). A closer inspection of the absolute elasticity values for native-born females and female immigrants, regardless of vintage, indicates that a rise in the demand for immigrant labour leads to an almost equal percentage increase in female native-born labour. This indicates that there is no significant difference in the female labour force by country of origin. A similar conclusion holds for the relationship between male and female native-born labour.

Table 9
Elasticities of Factor Complementarity
Female-Intensive SIC Groups, 1981

Elasticity Between	Value	Standard Error	T-Value
Female native-born and earlier female immigrants	.94	.12	7.9*
Female native-born and recent female immigrants	.98	.1	9.8*
Male native-born and earlier female immigrants	-1.2	.06	20.0*
Male native-born and recent female immigrants	-1.4	.06	23.3*
Male native-born and female native-born	.98	.02	49.0*

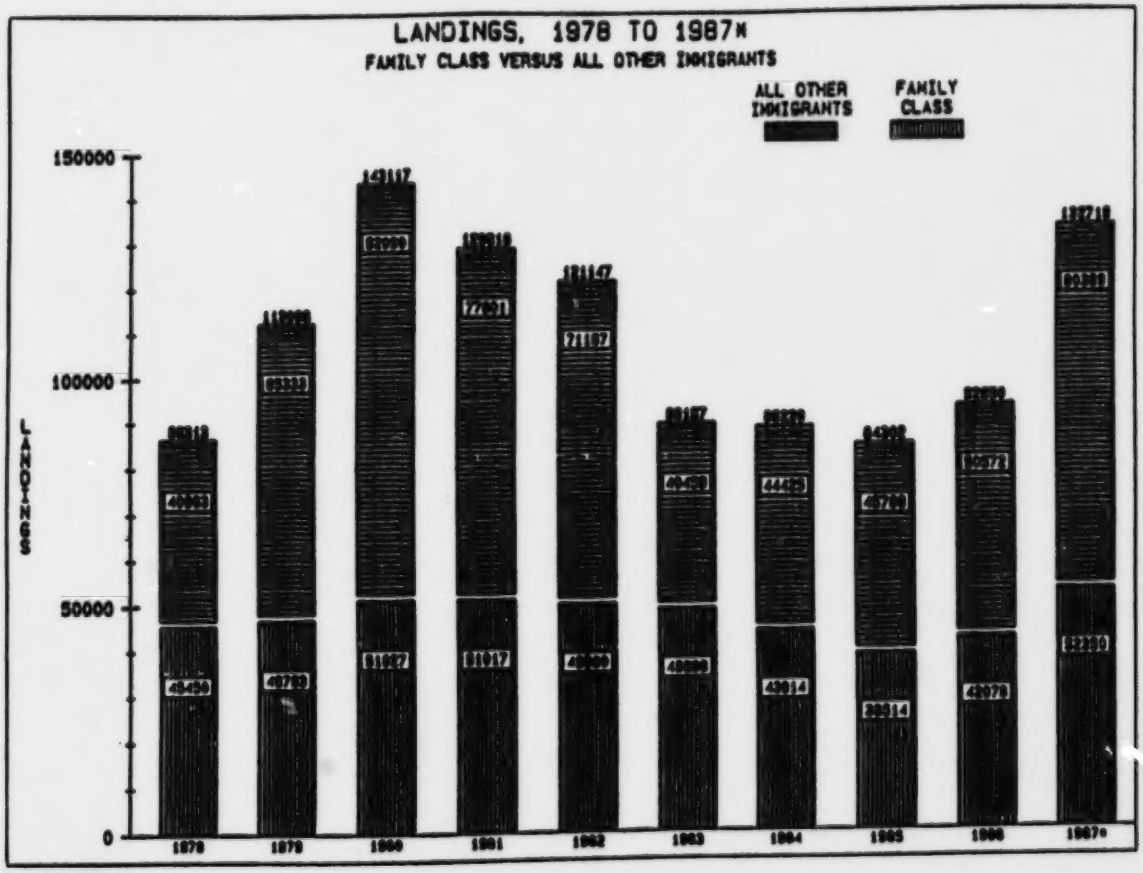
* Indicates significance at the 0.05 level of significance.

The Effect of Recent Flows

Major policy changes have occurred since 1978 that would be reflected in changes in the composition of the post-1980 immigrant flow. This could affect our 1981 results. An inspection of Figure 2 demonstrates two major post-1979 trends. First, total immigration flows were large in 1982 and 1983, then fell during the 1983 to 1986 period. More important, the predominant class of immigrants became the family class group. Thus, the cross-elasticities of the most recent vintage of immigrants could have changed with respect to the remaining variables if the labour market characteristics of the family class differed significantly from the previous recent immigrant class (i.e., 1971 to 1980). Moreover, it should be kept in mind that the cumulative total of immigrants in all classes was substantial—502,000 for the 1981 to 1986 period. Couple this absolute size with the high labour force participation rate of immigrants (52 per cent 1980; in Akbari 1987), and the gross increase in

Figure 2

Entry Classification of Immigrants



*Preliminary.
Source: Policy and Program Development Branch, CEIC.

the post-1971 foreign-born labour force component could be as high as 250,000. In addition, all classes of labour, even members of the post-1971 foreign-born group, are experiencing retirement. Thus, the net effect of the 1981 to 1986 immigrant flow on the post-1971 stock could be significant.

It is impossible to measure the net effect of the most recent inflow directly.[23] Nonetheless, we are able to measure the gross effect of the post-1980 inflow. Through a separate calculation we determined that our original set of 125 industries used in the 1981 elasticity calculations had a net increase of 13.8 per cent in post-1971 foreign-born labour. This is a downward-biased estimate of the impact of the newest immigrant inflow, since our calculation assumed zero retirement for the 1971 to 1980 foreign-born component.[24] In addition, fundamental changes were occurring in the economy as technological change and capital accumulation took place during the 1981 to 1986 period. The most important change over this period, however, was Canada's position in the business cycle. In 1982 the unemployment rate was 11 per cent, while by 1987 it had fallen to below 8 per cent. In sum, four factors could alter production coefficients: labour force size and composition, technological change, factor intensity and capacity utilization.

Given that the 1986 data were subjected to tests nearly identical to those used on the 1981 data, our evaluation of the results emphasizes only those results that differ significantly from the 1981 findings. After this summary statement, an analysis of the sources of differences will be given. It should be noted initially that to ensure comparability, the data sources and methodology employed in the 1981 portion of this study were followed closely. There were some discrepancies. The most notable difference was the reduction in the number of three-digit SIC codes in 1986. Only 107 three-digit groups were used in 1986, compared to 125 in 1981. However, this did not necessarily imply narrower coverage, because in many cases the 1986 data combined 1981 industry groups. In fact, in terms of labour force coverage the decline was only 13.5 per cent.

Given these data discrepancies and the dynamic nature of the Canadian economy, a comparison of 1981 and 1986 results illustrates extraordinary stability (see Tables 10 through 15). Only one elasticity out of the 20 paired comparisons differed significantly in magnitude or sign. All the capital elasticities with respect to the various labour groups were similar in magnitude and sign. Only the native-born and recent immigrant elasticity value in the industries with concentrations of foreign-born labour differ significantly between periods. This is an important exception. Since the income shares in these industries remained stable, the sole reason for the change in sign was the estimated production coefficients. In 1981, native-born labour and post-1971 immigrants were significant substitutes, but by 1986 this pair had become insignificant complements. It should be noted that the significant substitution between native-born labour and pre-1971 immigrants held in 1986 as it did in 1981.

Thus, we conclude that the pattern of labour substitution and capital complementarity reported earlier for foreign-born and native-born labour was maintained over the five-year time horizon.

Table 10
Absolute Variable Sizes and Factor Shares
107 Major Industries, 1986

		# (000s)	Shares (Actual)
1.	Native-born labour (thousands)	6,846	.56
2.	Post-1971 immigrant labour (thousands)	448	.04
3.	Pre-1971 (thousands)	1,197	.08
4.	Capital stock (thousands)	$557,018	.32

Table 11
Elasticities of Factor Complementarity
for 107 Industries, 1986

Elasticity Between:	Value	Standard Error	T-Value
Native-born and earlier immigrants	-0.97	.48	-0.47
Native-born and recent immigrants	.96	1.05	1.01
Native-born and capital	0.91	1.02	1.93**
Recent immigrants and capital	1.03	0.97	1.00
Earlier and recent immigrants	1.18	.39	0.47

** Indicates significance at the 0.10 level of significance.

Table 12
Elasticities of Factor Complementarity
Industries with Above-Average
Concentrations of Foreign-Born Workers, 1986

Elasticity Between:	Value	Standard Error	T-Value
Native-born and earlier immigrants	-.67	9.2	-6.2*
Native-born and recent immigrants	.63	1.5	.97
Between native-born and capital	.79	.92	.73
Between recent immigrants and capital	2.2	.68	1.51
Between earlier immigrants and capital	1.19	.56	.62
Between earlier and recent immigrants	.23	2.0	.46

* Indicates significance at the 0.05 level of significance.

Table 13
Elasticities of Factor Complementarity for
34 Industries with Largest Average Firms, 1986

Elasticity between:	Value	Standard Error	T-Value
Native-born and earlier immigrants	.27	20.5	5.55*
Native-born and recent immigrants	1.6	1.5	2.4*
Native-born and capital	12.85	1.15	14.7*
Recent immigrants and capital	.93	1.0	.94
Earlier immigrants and capital	.96	10.4	10.0*
Recent immigrants and earlier immigrants	1.06	.03	31.0*

* Indicates significance at the 0.05 level of significance.

Table 14
Elasticities of Factor Complementarity
High-Tariff SIC Groups, 1986

Elasticity between:	Value	Standard Error	T-Value
Native-born and earlier immigrants	-2.2	0.64	-1.41
Native-born and recent immigrants	.61	.18	.11
Native-born and capital	2.4	.77	1.85
Recent immigrants and capital	.98	10.6	10.4*
Earlier immigrants and capital	.98	9.4	9.3*
Recent immigrants and earlier immigrants	1.5	.30	.46

* Indicates significance at the 0.05 level of significance.

Table 15
Elasticities of Factor Complementarity
Female-Intensive SIC Groups, 1986

Elasticity Between	Value	Standard Error	T-Value
Female native-born and earlier female immigrants	.96	.10	9.6**
Female native-born and recent female immigrants	.99	.14	7.0**
Male native-born and earlier female immigrants	-1.8	.05	36.0**
Male native-born and recent female immigrants	-1.9	.07	27.1**
Male native-born and female native-born	1.01	.02	48.5**

** Indicates significance at the 0.01 level of significance.

Conclusions and Policy Implications

In this section we summarize our conclusions for each set of results and outline the corresponding policy implications. First, economy-wide there is no modern evidence as of 1980 that the post-war stock of immigrants significantly displaced workers born in Canada. In addition, this lack of substitution did not vary with the date of arrival of the immigrants. Also, economy-wide, the employment of immigrants did not require a significant amount of physical capital upon entry, while an expansion of the native-born labour force did. This lack of economy-wide capital complementarity for immigrants we believe was a result of the high human capital content of immigrants and is in direct contrast to Grossman's findings in the United States.[26]

If one of the continuing goals of immigration policy (as argued by Green 1976) is the successful absorption of immigrants, then our economy-wide findings indicate that this goal was met. If we define absorption as a limited displacement of native-born workers with a minimum impact on the use of complementary capital inputs, then the widely varying policy regimes outlined at the beginning of the paper met this criterion. Although we draw these conclusions from two cross-sectional tests, the results are more robust than might first appear. Since these economy-wide tests have incorporated all working immigrants from approximately the post-1945 period, the results reflect long-term adjustments under several expansionist and restrictive policy regimes. During the period of rapid economic growth between 1964 and 1975, Canadian immigration policy emphasized human capital qualifications. After 1975, the continued fine-tuning of the occupational point system, culminating eventually in an employment validation requirement, although restrictive, ensured the successful absorption of immigrants into the Canadian economy.[27]

This generally favourable evaluation of Canadian immigration policy is in sharp contrast to the apparent public perception that immigration takes jobs from Canadian-born workers. How do we reconcile these differences in the public perception of the results of immigration policy with the econometric economy-wide results? Is the public wrong? Are the econometric tests incorrect? The answer to both questions is no. The paradox is easily resolved by examining the nature of economy-wide test(s). First, we argued that the results were the outcome of a long-run process and reflected the degree of substitution throughout the economy. The public perception is short-run and based largely on asymmetric *ad hominum* logic. For example, the public recognizes successive waves of short-run displacement in particular industries. They do not balance this view by recognizing job creation by immigrants across industries or over time. This myopic and asymmetrical interpretation is partially incorporated in our disaggregated tests, and we assess this view in more detail below. However, the economy-wide results do indicate that at a maximum, a ten-year period is sufficient to offset any labour displacement by immigrants in general. This is confirmed by the fact that the pre- and post-1971 elasticities of complementarity for the economy-wide results were identical.

Our second main conclusion is that labour displacement did occur in several segments of the Canadian economy in 1980. These sub-sectors include industries with concentrations of foreign-born labour and female workers and those protected by significant tariffs. The findings in each of these tests have policy implications.

In the industries with concentrations of foreign-born workers, it appears that the necessary and sufficient conditions for significant substitution involve a combination of factors, including a greater than average foreign-born labour content and a large share of value added attributed to physical capital. Equally important, under these conditions we found that in this sub-sector recent immigrants require a significant amount of physical capital. This view of employment displacement by immigrant labour coupled with the phenomenon of capital using immigrants conforms to the general public view. However, Table 4 shows that this sub-sector does not conform to the stereotypical view of industries providing entry-level jobs for immigrants. In fact, the sub-sector includes both firms that use unskilled labour and industrial groups that are significant users of highly skilled human capital and that have experienced significant job vacancies.

These two labour streams reflect the two broad components of the immigrant flows that resulted from the post-1962 policy regimes. The use of the point system meant that the selected worker categories were human capital intensive, while the family re-unification group, with less stringent qualifications, contained less educated migrants. This clearly illustrates the dilemma inherent in attempting to achieve humanitarian and economic policy goals simultaneously.

To have found labour displacement and capital complementarity in the industries where foreign-born workers are concentrated is not surprising. However, less obvious was the finding that no significant labour substitution appeared in the 34 industries with the greatest value added per firm. Although these large-scale firms use more capital-intensive techniques than the economy in general, any differences in elasticity values appeared only with respect to capital. All labour inputs were complementary with respect to capital, but again, as with the economy-wide results, native-born labour required the largest increases in capital. This capital complementarity finding reinforces the wisdom of the recent policy emphasis on capital requirements for the business class of immigrants.[28] Hence, the general findings for the large-scale industries are consistent with current and recent past immigration policy.

An evaluation of Dales's argument in a modern setting is now possible given the results of our examination of tariff-protected industries. An inspection of Table 8 indicates that Dales's thesis is partially confirmed in a modern setting. Substitution does appear between older immigrants and the native-born labour force in the tariff-protected industries. However, no displacement occurs between recent immigrants and the native-born workers. This leaves us with an interesting exception relative to the economy-wide results. For the entire economy, both vintages of immigrants had insignificant but identical values for the substitution parameters, while in the tariff-protected group these values differed. Thus, we conclude that unlike the economy in general, the tariff-protected industries contain significantly different vintages of immigrant pools.

Also, in contrast to earlier findings, the tariff-protected industries all have a significant and similar capital/labour complementarity, regardless of the birth place of the labour force member. The absolute values of the elasticity terms suggest that the capital/labour ratio declined for native-born workers and remained constant for immigrants. This is exactly what Dales's thesis predicts, since under a neo-classical production function wages would fall absolutely and relatively for native-born workers. The policy implications of this finding are straightforward. Any policy that initially encourages the entry of immigrants to the tariff-

protected sector will cause unemployment for native-born workers and lower their wages. Controlling the immigrant flow to this sector is difficult, of course, because immigrants have occupational mobility.

An immigration policy that encourages female participation in the industries where female workers are concentrated will also lead to a unique set of labour market effects. First, no competition for jobs will appear between native-born female workers and immigrant women. However, growth in the female immigrant labour force will displace male native-born workers in these industries. The emerging picture from this sub-sector is of a continually shrinking male labour force being displaced by immigrant females. Furthermore, no substitution occurs between male and female native-born workers, and there are no significant cross-elasticities between capital and any labour force member. Hence, capital/labour ratios will fall, *ceteris paribus*, if immigration flows to these industries rise.

In sum, whether by design or by accident, the various immigration policies in effect in the postwar period have not led to any significant overall job displacement or increased capital requirements. However, in certain industrial sectors policies have caused displacement and must be adjusted to recognize these problem areas. The displacement-prone industries appear to have at least two common characteristics. First, capital receives a large share of the input (as in the tariff-protected industries and those with concentrations of foreign-born workers); and second, the displacement-prone industry labour force has a small amount of human capital (as in the tariff-protected industries).

Thus, it appears that an immigration policy that permits low human capital content in immigrants or finds this flow moving to the industries where foreign-born workers are concentrated (see Table 4) will exacerbate displacement. However, it is difficult to predict upon entry where immigrants will ultimately settle in the labour force.[29] What is required initially are longitudinal studies linking immigrant records to employment experience.[30] These studies could reveal the employment migration experience of immigrants and family members after their arrival. Once knowledge is gained on the movements of immigrants in all entry classes, policies could be put in place to deflect flows from displacement-prone sectors. Policies might include training, especially language training for female immigrants, which would give them greater occupational mobility. In addition, the point system or initial assessment for entry should penalize or exclude immigrants who will likely enter the substitution-prone sectors.

Notes

1. In Dales's version of Canada's fin de siècle immigrant experience, unskilled immigrant labour initiated the displacement effect in an open economy, sending native-born Canadians to the U.S. with the pull of higher wages.

2. Even more formally, you would obtain these results with a neo-classical production function in the absence of augmenting capital. Since the capital/labour ratio declines under increasing net immigration, wages must fall in this model. Also, this neo-classical analysis precludes increasing returns to scale since the underlying production function must be homogeneous to degree one.

3. DeVoretz and Maki cite evidence that more than a year passes before the average immigrant's application is processed. This is *prima facie* evidence of a substantial queue.

4. The slopes of the labour supply and demand elasticities of course determine the size of the estimated coefficients.

5. In a neo-classical world (according to Dales) the capital/labour ratio will determine the steady-state income per head. Thus, if immigrants are complementary inputs *vis-à-vis* native-born labour then, output per head will decline and *vice-versa*.

6. Since we indirectly estimate the degree of substitutability via share equations, we impose Euler's theorem to deduce capital's share and hence have assumed implicitly that the underlying production function has constant scale returns. This is not an unrealistic assumption since we are dealing with a cross-section of industries. Nonetheless, we removed this restriction in unreported results, and the economy-wide results were not statistically different for the restricted and unrestricted models.

7. For the 1981 economy-wide results Akbari and DeVoretz (1987) using the identical data set relax these restrictions and report results from the relevant F-tests. In neither case, i.e., relaxing homogeneity or symmetry properties, did the parameter estimates differ significantly.

8. See Akbari (1987, pp. 11-40).

9. Since we are estimating share equations, the share received by any one factor is dependent upon what is received by any other factor.

10. The actual share of income accruing to capital was 40 per cent in 1983.

11. In the literature Weaver (1983) uses fitted shares to compute elasticities. Antle and Aitah (1983) and Atkinson and Halvorsen (1976) employ actual shares in their computations.

12. Clearly, if data permitted, we would have preferred to define old immigrants as pre-1967 entrants to correspond with the date in the change in immigration policy. However, the census does not permit this cross-classification.

13. One referee suggested that heteroscedacity is a potential problem that could reduce the efficiency of our estimates if we used untransformed data under OLS. Nonetheless, there is no evidence that the variance of the disturbance terms is significantly (and positively or negatively) related to any of the independent variables in our economy-wide results. This of course is consistent with our findings that there are no scale economies, since with

scale economies (or diseconomies) the variance in the disturbance term would grow with the size of the output.

14. Using economy-wide factor share equations for five major occupations they found that in general most occupational groups substitute for one another. However, they do not distinguish labour by place of birth and essentially beg the question since they are unable to identify immigrants. Their capital variable does not suffer from this specification error and they do find that physical capital and labour for all their occupational groupings are complements. Their elasticities of complementarity with respect to capital ranged from .3 to 3.4. Hence, our Canadian economy-wide value is consistent with their findings.

15. Roy also attempts to measure the degree of substitutability between native-born and foreign-born Canadians from occupational wage equations. Roy finds substitution between some immigrant labour and the native-born in four of the 60 wage equations. Of course, what he could be capturing in the wage equations is the effect of the omitted capital variable, which was found to be a significant wage conditioner both in the disaggregated results of this study and the work of Clark and Thompson (1986). The separability of capital in our disaggregated results is not inconsistent with the earlier economy-wide findings that capital is separable. First, our disaggregated results with capital separability all form a proper sub-set of the economy-wide data. For example, similar three-digit level industries appear for the foreign-intensive, female-intensive and tariff-intensive groupings. The technologies of these industries are such that expansion of output requires capital to be a variable input, i.e., not separable. The remaining 60 industries not covered by these cross-classifications find capital a fixed input, i.e., separable, and hence in the aggregate, separability is found. This finding is similar to Grossman's in the U.S., where she reports capital separability for various configurations of the U.S. economy.

16. The evidence for Clark and Thompson, Maki and Meredith (1987) and the disaggregated results in this study all indicate that capital is not a separable input in the Canadian production function.

17. We chose 23 per cent since this equalled one standard deviation to the right of the mean of foreign-born workers in the economy-wide labour force.

18. The combined industries have the following SIC designations: 101, 243, 244 and 806.

19. The calculation is as follows. Given a foreign-born stock, *circa* 1980, of our selected 59 industries of 379,645, we multiplied this figure by -.0067 to arrive at the displacement size.

20. For our selected 59 industries capital's share was 63 per cent. In contrast, Grossman's grouping had a 49 per cent capital share.

21. Scale effects are the real issue. First, we divided the sample in half, i.e., 66 industries. Next, we measured the value added per employee as our primary size cross-check. Now, if the industry had both a high absolute value added per SIC grouping at the three-digit level and a high value added per employee, we included it in our sub-sample. Thirty-four industries passed these criteria.

22. This percentage was two standard deviations greater than the mean percentage of females in all 125 industries.

23. Since the industry coverage in the 1981 and 1986 tests is not comparable, a simple comparison of Tables 2 to 10 will not allow us to deduce the gross increase in the supply of foreign-born labour.

24. This assumption of zero retirement was made since we do not have Census data on labour market separation for the 1971 to 1980 immigrant entry class.

25. For 1981 the recent immigration group received 12 per cent of the industry group's income while in 1986 the value for this group was 11 per cent.

26. Grossman (1982, p. 599) found that immigrants had the highest degree of complementarity with respect to physical capital. However, she does note that unskilled labour had a greater degree of complementarity with respect to physical capital than highly skilled immigrants.

27. In fact, it can be argued that the post-1981 policy, which carefully screened immigrants by occupational qualifications, recognized these impacts.

28. In addition, a recent study by DeVoretz (1988) indicates that foreign-born Canadians accumulate capital faster than the general population.

29. S.B. Seward (1989) contains a detailed discussion of the ultimate actual destination of immigrants by various industrial classifications. A cross-check with our displacement-prone industries would be instructive.

30. This research tactic is currently being considered by Employment and Immigration Canada in conjunction with several other interested parties.

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